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ABSTRACT

This paper describes the efforts of a host community generally referred to as a "Collaborative Community" and comprised of the Biology and Math departments of the University of Wisconsin-Stout (UW-Stout), the Math and Biology Departments of the University of Wisconsin-Eau Claire (UW-EC), and the Departments of Math, Biology, and Chemistry of the University of Wisconsin-River Falls (UW-RF). The group's major focus is that of realizing the following goals: (1) Increasing the active participation of students, particularly women and minorities in math and science classes; (2) increasing the comfort level of women and minority students in the science laboratories; (3) increasing the emphasis on the importance of math and science in real world applications; (4) increasing the students' self-confidence in doing math and science; and (5) developing alternative teaching methodologies to replace the traditional lecture format. Included in the document is a discussion of the community's plan of action to realize the aforementioned goals, schedule of workshop events, a description of the roles that a Distinguished Visiting Professor and a Faculty Fellow play in this process, and an article entitled "Science, Diversity, and Community: Revitalizing Introductory Science Curricula: An Overview." (ZWH)

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THE MAKING OF THE FACULTY: FOSTERING PROFESSIONAL DEVELOPMENT, CURRICULAR INNOVATION, AND TEAMWORK THROUGH A COLLABORATIVE SCIENCE COMMUNITY

Panel Presenters:

Dr. Jacqueline Ross, Director, University of Wisconsin, Women's Studies Consortium
Dr. Rebecca D. Armstrong, Director, University of Wisconsin, Women and Science Program
Dr. Sherrie Nicol, University of Wisconsin-Platteville, Distinguished Visiting Professor at University of Wisconsin-Eau Claire, River Falls and Stout
Dr. Loretta Thielman, Faculty Fellow, University of Wisconsin-Stout

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The Collaborative Community

The host community generally referred to as our "Collaborative Community" is made up of the Biology and Math Departments of University of Wisconsin-Stout (UW-Stout), the Math and Biology Departments of University of Wisconsin-Eau Claire (UW-EC) and the Departments of Math, Biology and Chemistry of University of Wisconsin-River Falls (UW-RF). This collaboration was born during a three hour drive down to the University of Wisconsin-Madison in the fall of 1992 for the Program's kick-off conference, "Science, Community, and Diversity: Revitalizing Introductory Curricula" which featured Shelia Tobias with the keynote address, "Women and Science: Mainstreaming Change". Sharon Nero, Sociologist and Women's Studies Administrator from UW-Stout; Sheue Keenan, Chemist, UW-River Falls; and Gwen Applebaugh, Mathematician, UW-Eau Claire subsequently became the "Campus Coordinators" for this collaborative science community.

The plan of activities they proposed in order to meet their curriculum goals included having the Distinguished Visiting Professor (DVP) teach an undergraduate introductory course at one of the three campuses; make 2-3 visits to each of the other two campuses during the semester; and conduct one workshop and/or seminar at each of the three campuses for science faculty from all three campuses. These curriculum goals included:

1) Increasing the active participation of students, particularly women and minorities in math and science classes
2) Increasing the comfort level of women and minority students in the science laboratories
3) Increasing the emphasis on the importance of math and sciences in real world

applications

4) Increasing the students' self-confidence in doing math and science

5) Developing alternative teaching methodologies to replace the traditional lecture format.

There is already indication that the collaborative community is moving towards their goals. At the end of the fall semester, Professor Nicol learned that one of her brightest students, a non-traditional female student, had only taken the course on a pass/fail basis because of her fear of failure. She is but one of many students who fear math and yet have talent unknown to themselves. The curriculum committee of one department began last semester to completely overhaul its introductory math course curriculum and is incorporating new kinds of word problems which deal with subject matter other than missiles and ballistics. Several female and male students have been heard to remark in the journals they keep in an inquiry-based introductory chemistry lab course that the lab is "fun" and they are "enjoying the lab". The traditional lab manual for this course is being re-written, incorporating new experiments and approaches to teaching this laboratory course. Since this foundation course is taught by many different faculty members, it is "owned" by the department--making this change is very dramatic and important.

In the process of selecting this proposal for funding and identifying potential DVP's the Women and Science Program was able to offer this community two DVP's in back to back semesters. We are currently in the midst of the second semester. The community started with six faculty fellows who have received release time from one course during one semester, to facilitate their participation, and a seventh fellow was added this semester. In addition, there are several "unofficial" faculty fellows who have not received any release

time or compensation, yet have been extremely active with the program. It is an interesting dilemma that the wife of one of our unofficial fellows who is also a scientist was directly discouraged by her department from any participation in this program yet her husband is actively encouraged by his department. Both of them are in tenure-track positions.

As a result of the two semester program expansion and the inter-institutional collaboration, there are particular challenges and opportunities that other host communities have not experienced. Not the least of which is the time and scheduling challenges for the DVP. What was planned as a few workshops or seminars has evolved into a major demand on the DVP's time as more and more groups of faculty and students make use of her expertise.

The major opportunity that this community has experienced is time; enough time for the program to evolve. This evolution includes:

- dissemination of information about the program to faculty via written information and personal communication. This is one of the more important things I have learned in the administration of this program which I will address latter.
- recruitment of faculty within and outside of the community to participate, e.g. this semester some faculty from the humanities and arts are attending discussion groups with the scientists
- trying out new pedagogical techniques and revising syllabi with the expert DVP's help
- faculty getting comfortable with the DVP to have her sit in on classes or sit in on her classes
- time to address logistical, financial, and communication issues that arise

- and time for the building of trust and honesty for faculty to open up, discuss and confront the issues which hereto had been ignored or denied, e.g. the importance of climate.

Another benefit of the two-semester involvement includes the increased dialogue that has occurred between institutions which facilitates the development of the faculty fellow's community as well as the larger science community. Furthermore, the opportunity to work with two Distinguished Visiting Professors, one from within the UW-System and one external, exposes the collaborative community to different philosophies, strategies, scientific disciplines, interests, ideas, and skills that the DVP's have.

The challenges to this collaborative community are particularly significant due to the scope of this endeavor. In particular, this is the only inter-institutional host community to date that has participated in this program. All other collaborations were within one institution. This presents a particular challenge in that the level of commitment required of the host community and DVP is substantial. This commitment is needed from the administrators, the faculty, the faculty fellows, the campus coordinators, and from the DVP who is traveling amongst three institutions. I could talk extensively about any one of these parties' commitment. Yet within this one collaborative community there was the need for flexibility with our model for faculty development. This flexibility was necessary for institutional personalization which encouraged ownership of the program and increases the likelihood of institutionalization of the program activities and goals.

The last, and perhaps over-arching challenge is to create communities that can facilitate a paradigm shift in the sciences. In order to bring this about, communication between experts in gender and science issues, faculty, and administrators must be facilitated

by establishing avenues of communication as well as time for dialogue. Furthermore, for a program such as ours, there must be flexibility for negotiation to tailor the model to meet individual institutional needs. For example: one campus wanted activities to facilitate women faculty to connect and support each other; another had young tenure-track women scientists who needed mentoring and a role model. The collaborative science community of UW-Eau Claire, River Falls and Stout is beginning to make this paradigm shift which should facilitate the retention of more women and minority students and faculty in the sciences and change how science is viewed and taught in the UW System.

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Collaborative Community Workshop I
October 2, 1993
Dr. Sherrie Nicol, UW-Platteville,
Distinguished Visiting Professor (DVP)
"Butcher, Baker, or Candlestick Maker?"
Host Campus: UW-Eau Claire

Saturday, October 2, 1993
Faculty Fellows and faculty interested in science/mathematics

8:00-9:00	**Registration**
9:00	**Opening Address: "Butcher,Baker, or Candlestick Maker? Teaching Content, Styles, and Outcomes." Dr. Sherrie Nicol, DVP**
10:30	**Break**
10:45	**Question/Answer Period**
11:30	**Lunch**
12:45	**Sessions**
	Mini Workshop A - Relevance: "Current Affairs and Past History"
	Mini Workshop B - Anxiety: "I'll Never Take Another Class Like This Again"
1:45	**Break**
2:00	**Sessions**
	Mini Workshop C - Ownership: "I Found It, It's Mine"
	Mini Workshop D - Cooperation: "Three Heads are Better Than One"
3:00	**Break**
3:15	**Wrap-Up: "Stop Making Sense"**

Collaborative Community Workshop IV
February 26, 1994
Dr. Cheryl Ney, Capital University
Distinguished Visiting Professor (DVP)
UW-River Falls
"Teaching and Learning Science and Math in a Postmodern World"
Host Campus: UW-Eau Claire

<u>Saturday, February 26, 1994</u>
Faculty Fellows and faculty interested in science/mathematics

8:00-8:45	**Registration**
8:45-9:00	**Welcome**
9:00-10:30	**Opening Session: Dr. Cheryl Ney -- "Positive and Constructivist Understandings About Science and Their Implications for Science/Math Teaching and Learning."**
10:30-10:45	**Break**
10:45-12:15	**Mini-Sessions A & B** **Session A - "Writing in Science & Math Courses"** **Session B - "Mentoring and Femtoring"**
12:15-1:15	**Lunch**
1:25-2:45	**Mini-Sessions C & D** **Session C - "Bringing the History of Women in Science and Math to the Classroom"** **Session D - "Teaching Epistemology (the nature of knowledge) from a Constructivist Perspective"**
2:45-3:00	**Break**
3:00-3:45	**Closing**

My Role as a Distinguished Visiting Professor
Sherrie J. Nicol

As Becky and Jackie have mentioned, I spent the Fall semester as Distinguished visiting professor in the collaborative community of UW-Eau Claire, River Falls and Stout, where I worked with 9 faculty fellows including 2 biologists, 1 chemist and 6 mathematicians, 3 of whom were unofficial fellows in that they did not receive release time or other monetary compensation for their participation.

As I began planning for the semester, I looked at the strategies I use in teaching that make my classrooms female-friendly. Four themes emerged: anxiety reducing methods, cooperative exercises, relevant content examples, and ownership strategies which encompasses both responsibility and discovery. I wanted the faculty fellows to learn about these strategies, and I decided to further exemplify them by using these methodologies in my interaction with the fellows. I did not explicitly indicate this to the fellows and by the end of the semester, not all of the fellows realized what I was trying to do. Some of the fellows urged me to provide them with concrete discipline specific examples that they could take immediately into the classroom . In other words - they wanted me to be a banker-teacher to them as opposed to the midwife-teacher with them. But, by the end of the semester, they were all fairly comfortable with the style I chose.

The fellows and I began the semester in preparation for a Saturday workshop in early October which would be open to all science/math faculty at the three campuses. The workshop was planned as follows (OH). The miniworkshops were run by the faculty fellows in teams of two or three, which forced the fellows to learn about cooperation (although an initial objective of cross-campus teams was not feasible due to a lack of class coordination and release time). The topics were certainly relevant to the profession of teaching, and by providing the fellows with articles and texts on the topics which were not necessarily from their own disciplines, I expected them to discover how they could extrapolate from the examples in other disciplines to their own. All the fellows experienced intense anxiety at the onset - they were being asked to present a mini-workshop on a teaching strategy which they did not use regularly in their own classes. After the October workshop, which had been well received, the fellows began to feel more comfortable and self-assured about the program.

As for the Saturday workshops - they were not as well attended as I would have liked. Roughly 30 faculty attended each workshop. There were several factors which may account for the lack of

involvement in the workshops: first people treasure their Saturdays the choice of day may have affected turnout. Second - there was a misconception about the program that I think is problematic with all programs that incorporate the words Women and Science in a title. I was informed by a department chair that his faculty were talking about the workshop as if it would be some touchy-feely exercise in consciousness raising, and that there was an implied lowering of standards in any program of this nature. A third factor is the notion that only mathematicians will benefit from a talk about teaching that is given from a mathematician. I really don't know how to deal with these last problems - I read and reread the fliers about the workshops and was unable to read between the lines enough to draw these type of conclusions. If anyone has a suggestion , I'd love to hear it.

Well, as the Saturday workshop did not draw in as many faculty as I would have thought an NSF sponsored program might, I decided to take my show on the road and make myself available to departments for one-hour presentations which summarized the first workshop. In this setting, I spoke with faculty from ten different departments about gender differences in cognitive development and learning styles.

Another facet of my stay with the faculty fellows involved hosting open discussions. Ideally, it would have been nice to have an open discussion of an article or topic at one campus with all the faculty fellows in attendance and any other interested faculty, but scheduling was impossible. Advance planning to mesh the schedules of the fellows would be convenient in the future. Given the situation, I held about eight different discussions at each of the three campuses. To inform faculty of upcoming discussions and the Saturday workshops, I sent out a one-page newsletter every few weeks.

The discussions were open to all faculty, but were held at a time so that the faculty fellows at the particular campus would be able to attend. Here (OH) is a list of the discussion topics. On the whole these were well attended by faculty from a variety of disciplines. However, the first one was attended primarily by mathematics faculty - again the notion that only a mathematician can learn from an article about mathematics education was the probable cause of the lack of involvement in this discussion by non-mathematics faculty.

The next two discussions were lively but disheartening; several faculty members thought the readings were too humanities based and wanted future discussions to involve math and science only. Other people indicated that they thought the material was male-bashing and urged me to consider only material that presented male and female teachers both in positive and negative

situations.

The remaining topics were at the request of the fellows, and the participation at these discussions was very good. Of particular interest were the topics of cooperation and discovery.

The December workshop focused on community building. Some of the initial planning that has taken place includes: setting up newslists in several disciplines to discuss pedagogy and methodology; seminar/colloquium sharing, where departments on the 3 campuses inform one another of upcoming talks and use the faculty as resources for talks/joint research; meetings of the math and chemistry faculty at annual professional conferences. In addition, many informal friendships have evolved around common educational interests.

An important facet of the program was my teaching. I taught a College Algebra course at the Eau Claire campus. It was unfortunate, but predictable that I was unable to vary the content from the other sections of the course. Early in the semester, I invited any interested faculty to observe my class at any time, and quite a few did. These were mostly mathematicians at Eau Claire; but occasionally faculty from other departments would visit. Originally we planned to videotape the class, however setting a fixed camera in the back would have missed the important teacher-student and student-student interactions that characterize my teaching style.

The final aspect of my visit involves the informal interaction that occurred in the math department at Eau Claire. My colleagues often visited my classes; and I visited their's as well. A particularly interesting visit involved the observation that one of my male colleagues spent the majority of the class time (43 of 50 minutes) standing at and talking to just a third of the class. This I believe was due to the structure of the classroom, where the door, pencil sharpener, light switch occupied one-third of the front space, while the chalkboard occupied the other two-thirds, where the overhead was in the center of the chalkboard - not the center of the room. Most of the time he stood in the corner farthest from the door, sometimes moving to the overhead, but seldom to the third of the room by the door. Unfortunately the class had more or less segregated itself so that the third by the door was predominately female, while the third furthest from the door was mostly male. As I taught in the same room, I became particularly concerned with my own position in the class.

Another part of the informal interaction involved the other teachers of College Algebra who began setting up real course coordination where they met and discussed alternative methods for presenting difficult concepts. There was a true sharing of teaching strategies that began to take

place.

Together Walter Reid and I developed a plan for academic journal-portfolios with entries once or twice a year so that a student may view their educational experience as a continuum with growth and change. In addition, the journals could be used by the department for assessment of the program.

I also presented one of my favorite talks, "Diary of a Female Mathematician" to an elementary education mathematics class, the mathematics department at UW-Stout, the high school teachers in attendance at the UW-River Falls Science Fair, and to the faculty at one of the Eau Claire middle schools. This is a presentation which relates the diary entries of a fictitious female mathematician from preschool through Ph.D. with the corresponding research on cultural and societal influences on education and career choice.

Personally, I found the experience very rewarding. I learned a considerable amount about collaboration and teaching during the semester, and developed some lasting friendships.

OCTOBER WORKSHOP

Butcher, Baker, or Candlestick Maker?:
Teaching Content, Styles and Outcomes.

Mini Workshops:

Relevance:	Current Affairs and Past History
Anxiety:	I'll Never Take Another Class Like This Again!
Ownership:	I Found It, It's Mine.
Cooperation:	Three Heads Are Better Than One

DECEMBER WORKSHOP

A Community of Educators-Learners

Plans for interaction in the collaborative community:

- Newslists for educational pedagogy & methodology in mathematics, biology, physics.
- Seminar/colloquium sharing.
- Annual professional meeting get-togethers planned with chemistry and mathematics faculty.
- Informal interaction, friendships between departments and campuses.

OPEN DISCUSSION TOPICS

- "The Voices of Women Making Meaning in Mathematics", Dorothy Buerk
- "Toward an Education for Women", Chapter 9 of *Women's Ways of Knowing*
- "Connected Teaching", Chapter 10 of *Women's Ways of Knowing*
- Journal Writing in College Algebra (Marc Goulet)
- Cooperation in Math/Science Classes
- Relevance in Math/Science Classes
- Discovery Techniques in Math/Science Classes
- Anxiety Reducing Strategies

INFORMAL INTERACTIONS

- Classroom observations
- Course coordination
- Academic journal/portfolio development
- "Diary of a Female Mathematician" talk

Experience of the Faculty Fellows:

The Faculty Fellows of the Collaborative Community are a diverse group coming from three different institutions, from Mathematics, Biology or Chemistry, having a tenured position, a probationary tenure-track position or a non-tenure track position, and a having a wide variety of years of teaching experience. I am here to tell you a little about my experience.

When I read the program description, I knew immediately that I wanted to be a faculty fellow and I also knew who I would want for the Distinguished Visiting Professor: Dr. Sherrie Nicol. Several times over the past nine years, I attended conferences about teaching which inspired me try out some new teaching strategies. I wanted my students to be active learners who actually appreciated the mathematics or statistics I was trying to convey. Unfortunately, my inspiration and resolution to try new methodologies always faded under the the pressures of time and other responsibilities. I felt I really needed TIME to think about incorporating new teaching techniques into my classes. Having a support group or even one other person with similar interests to keep me going would have been even better. Best of all would be having an expert providing a working model right in my department, available for my observation plus a coach who could get me started and keep me on track. This program proposed just what I wanted for myself--the opportunity to become a more effective teacher. I had met Sherrie at one of these teaching conferences and quickly decided I'd love to have her at UW-Stout to show me THE WAY. Therefore, I was really READY when the program description came out.

The project has not turned out exactly the way I at first envisioned it. First, I assumed that a D.V.P. mathematician would come to the Mathematics Department at UW-Stout and I would have to share her with one other faculty fellow. When I heard of the

proposal of the C.C., I admit I was quite skeptical that it would work very effectively or that any D.V.P. would even agree to spreading herself among three campuses, but I still was interested in being a F.F., even if the D.V.P. turned out not to be a mathematician. Even when it became clear that I would have to share the D.V.P. with six other F.F.'s, I was still very focused on what the D.V.P. could teach me.

Second, I expected her to teach me (us) how to teach using collaborative learning, writing-to-learn, discovery method, emphasizing the relevance the subject matter, and improving classroom climate by example, (which she certainly did), but also by distilling all her hard-won knowledge into quick easy-to-swallow lectures, (which she certainly did not). At our first meeting, Sherrie and all us faculty fellows introduced ourselves. Sherrie then told us she thought that at the first Saturday workshop, the F.F.'s would jointly lead one of the mini-workshops. We could choose from: Cooperative Learning, Relevance, Ownership and Science Anxiety. I was shocked at the thought of leading a mini-workshop on a topic about which I had very little first-hand knowledge or experience. I learned much later that my reaction was common among the F.F.'s. I signed up for the Cooperative Learning mini-workshop along with a fellow from U.W.-E.C. Sherrie had lots of reference materials for all of us. She all supplied counseling and moral support. I talked with my partner on the phone and then we had a planning session/dress rehearsal face-to-face. We planned several activities where the participants worked in cooperative groups. It was great. The time flew by. We had a mini-continuation during the third Saturday workshop. It then suddenly dawned on me, that Sherrie had used the most effective teaching techniques on us from Day 1: she assigned us the task choosing a topic, forming cooperative groups, providing us with reading materials, we needed to choose what we would do in the mini-workshops, we assumed ownership for our topic, we experienced and overcame our anxieties and we experienced the power of cooperative problem-solving. I saw the cooperative learning experience

from the student's point-of-view. It was a tremendous lesson.

Third, once I heard that we would have a two-semester project with two different D.V.P.'s, I thought I might learn the most in the first semester from THE MATHEMATICIAN. The second semester has been just as stimulating as the first. Dr. Cheryl Ney, coming from a chemistry department in a private college, has fresh ideas and insights which I see have great potential for application in mathematics and statistics classes. For example, Cheryl emphasizes that science is not a collection of facts to be discovered and passed on. Real science is the quest for better and better models for understanding the relationships among the members of the universe. One reason I chose to be a math major in college was because there were right answers and I was fairly successful in finding them. When I was assigned to write a composition in English class, there was no clear "right answer" for me to find. As I studied more mathematics and certainly when I began studying statistics, "right answers" were not so important as methodologies and finding connections between structures, using models to try to describe relationships among the components of a problem--PROBLEM SOLVING. This semester, I am learning to use the new methodologies in a College Algebra class, thanks to the knowledge and support I've gained and, most importantly, through the released time I have obtained through this project. I use formal cooperative groups in my class. I give individual and group assignments, group quizzes, individual exams, student journals for writing about the mathematics and/or about their feelings about the class, how they are doing, how their groups are working, anything affecting the class experience. I am working on a Cooperative Learning Handbook for the course to share with my colleagues if they are interested in this teaching approach. There are about a dozen colleagues in my department who have been faithful participants in group discussions and the Saturday workshops. These together with dozens more from other departments on our campus and the other two campuses have formed a community of

common concerns and purpose--to better reach and teach our students about our loves: science and math.

I at first looked to this project to help me be a better teacher, envisioning the D.V.P. as the primary source of my growth, almost like a parent-and-only child relationship. However, what I got was growth and support from all participants in the project, more like an extended family. It was something like a child who grows up in a very nice orphanage but longs to have parents of her own. She is so happy to hear she is to be adopted but then is dismayed to find the parents already have a half-dozen other children. She soon finds that having the other children to turn to for company, support, help and love is an unlooked-for blessing. Then when she also finds she has grandparents, aunts, uncles and cousins with which to share her life, she is amazed at how narrow her vision had been and how rich it turned out to be. I feel refreshed about teaching and very hopeful for the future. If we can continue to work together, we can meet and overcome many obstacles that formerly appeared formidable. I believe in cooperative learning!

Science, Diversity, and Community:

Revitalizing Introductory Science Curricula: An Overview

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Science, Diversity, and Community:
Revitalizing Introductory Science Curricula: An Overview

"Science, Diversity, and Community, Revitalizing Introductory Curricula" is a comprehensive National Science Foundation (NSF)-funded project, the overarching purpose of which is too promote permanent systemic change -- a paradigm shift -- in the way that science and science education are regarded and carried out within the University of Wisconsin System. And it is this goal that makes this project risky and difficult but very exciting and rewarding. If it is as successful as we hope, this project will become institutionalized within our system and should serve as a model for other institutions, large and small, to carry out similar efforts elsewhere.

Within this overreaching purpose or framework, the major goal of the NSF-funded project, "Science, Diversity, and Community: Revitalizing Undergraduate Curricula," is to attract and retain qualified female and minority students in science, mathematics, and engineering by improving the quality of undergraduate science education for both women and men. In so doing, the program seeks to reverse female and minority attrition from science at a point at which it is most acute in higher education: introductory courses of the undergraduate science program.

The Women and Science Program is sponsored by and is administered by the University of Wisconsin System Women's Studies Consortium, which serves as a formal organization of the Women's Studies Programs in all of the degree-granting institutions -- including the two doctoral, eleven comprehensive, and thirteen freshman-sophomore campuses -- in the UW System. The Consortium has identified curricular reform as one of its primary goals and, because of the challenges presented by the sciences, designated Women and Science as a focus area within that goal. A systemwide Women and Science Advisory Board -- composed primarily of scientists nominated by the Vice Chancellors of each UW institution -- also helps to guide the program.

The Women and Science Program is an eight-semester visiting professorship, curricular and faculty development program that brings together students and faculty at UW System institutions with eight Distinguished Visiting Professors (DVP's) of Women and

Science -- from inside and outside of the UW System -- who have successfully implemented teaching innovations at their home institutions. By the conclusion of the project period, each of the eight DVP's will have visited a "science community" made up of one or more science departments in one or more UW institutions; they will work with a total of at least seventeen Faculty Fellows in the Host Communities. The program is designed to reform introductory curricula and increase female and minority representation in science by: a) increasing faculty expertise in gender and science scholarship and pedagogy; b) providing role models of professional women scientists; c) improving classroom and campus climate; and d) creating "science communities" that will promote effective learning. Since these innovations have been shown to be attractive to white men as well as to women and people of color, this project should gradually effect an increase in the total number of students majoring in the science.

The typical DVP spends a full semester at a UW science community, teaching a model introductory science or mathematics course, holding seminars on the incorporation of the new scholarship on gender and race-related content and pedagogy into introductory science teaching, and working closely with Faculty Fellows from the Host Communities to develop new course materials and syllabi. (Each Faculty Fellow is expected to develop a new and/or revised course and teach it within two years). The program will also develop a Cadre of Faculty Development Experts, made up of Faculty Fellow's and other participating faculty, some of whom will serve as DVP's and others who will facilitate workshops on other UW campuses. A systemwide Women and Science Advisory Board helps to guide the direction of the project.

Building Science Communities

Building interdisciplinary science communities has been an organic process, beginning with a nucleas of science and women's studies faculty and extending to include many other faculty, staff, and students from a variety of disciplines as well as administrators. In fact, the process has involved defining and redefining just what is meant by such a community.

Responses to a kickoff conference, attended by one hundred and fifty faculty from across the UW system, held in the fall of 1992 were an early indication that faculty and staff interested in science education welcomed a rare opportunity to network and discuss reform of

the science curriculum with a wide spectrum of colleagues from across the state. . Interestingly, an overwhelming majority of participants identified improving the climate and developing a sense of community as the most important elements in attracting more qualified students -- including women and minorities -- to the science; this initial judgement has been reiterated and underlined by faculty on host campuses.

Professor Ethel Sloane (Biology, UW-Milwaukee) was the first Distinguished Visiting Professor in the spring of 1993. Sloane visited the University of Wisconsin Centers and taught her course, "The Biology of Women," at UWC-Waukesha. Professor Sloane also worked with Faculty Fellows from three UW-Centers campuses to prepare new or revised course syllabi. Faculty mini-conferences were held -- conducted by Sloane, the FF, and members of a Centerswide science improvement group -- for the science faculty of all the UW Centers. Evaluations indicated a very positive response with participants saying that they appreciated the opportunity to discuss and share ideas on the topic of science curricula reform. Again, the necessity of improving climate and the sense of community was identified as most critical to success.

While Sloane's visit to the UW-Centers was called for as a part of the Women and Science Program's initial proposal to the NSF, subsequent Distinguished Visiting Professorships of Women and Science have been allotted to UW System institutions by a competitive internal proposal process conducted during 1992-93 and this spring semester. Awards are based on the institution's level of commitment to curriculum reform: a "critical mass" of host participation in faculty development activities, institutional support for curriculum reform, as demonstrated by institutional matching funds and other resources, and evidence of commitment to collaborative activities within or between institutions.

A total of four Distinguished Visiting Professors of the Women and Science are scheduled for the 1993-1994 academic year and fall semester 1994, three of whom spend a full semester at a UW System institution. Two of these DVP's, Sherrie Nicol (Mathematics, UW-Platteville and Cheryl Ney (Chemistry, Capitol University), have been based at a Collaborative Community -- comprised of UW-Eau Claire, UW-River Fall, and UW-Stout -- during this academic year -- I'll come back to this community later. The UW-Madison Chemistry Department will be host to Vera Kolb (Chemistry, UW-Parkside), the third DVP,

in the fall of 1994.

The fourth DVP, Sue Rosser followed a different model, as requested by the Consortium Executive Committee and designed by her in collaboration with participating institutions who submitted successful proposals for her visit. Professor Rosser circulated among nine UW institutions, initiating faculty development activities. She spent an average of two to three days at each of these campuses, giving workshops and talks attended by faculty and administrators; she also met individually with faculty particularly interested in curricular revision. From all accounts, these events were well attended and received.

The program, pending final approval by NSF of its concluding phase, will continue through the 1995-96 academic year; we are currently requesting nominations and/or applications for DVP's, and the call for proposals has been distributed. At the conclusion of the project, we are planning for its institutionalization through the Cadre of Faculty Development Experts and other strategies. We also intend to create a number of "products," including a comprehensive project which will describe how our collective applied theories of women and science have been evolved, what we have learned, and how to go about doing what we have done -- this should serve as a kind of blueprint for others hoping to form science communities with similar goals. Other products, in addition to the revised courses, include laboratory manuals, handbooks, articles, and conference presentations within the state and nationally. While we recognize that the culture of each department, college, and institution is different, we believe that the commonalities -- manifested in attitudes and practices that present both barriers and opportunities -- we have experienced in the course of this project will ring true in a wide variety of situations.

The Collaborative Community: Rebecca Armstrong, the Project Administrator, will focus on the Collaborative Community, to which I referred before, which has turned out to be challenging and innovative from a variety of perspectives. Professor Sherrie Nicol will relay her experiences in that capacity last semester. Loretta Thielman, who has been a Faculty Fellow in the program, will talk about how her perspectives on science education in general and science communities in particular have evolved. I use the term "evolve" frequently in speaking of this project because, as it has progressed, all of us have been in a process of learning -- hence frequently effecting alterations in how we carry out our roles in

the community.

Since she is not here today, I want to quote briefly from Cheryl Ney, our current DVP in the Collaborative Community, who is involved in a wide variety of activities, ranging from formal to informal at all the campuses. These activities include teaching at UW-River Falls and facilitating, with the Faculty Fellows, colloquia on such topics as epistemology and teaching practice, the discovery/hands-on, learning by inquiry approach to teaching, and "contextualizing the discipline: the interdisciplinary field of science and technology in society." Commenting on her role, Professor Ney says, "Faculty development activities have traditionally focused on curriculum and teaching strategies. This often translates into the expectation that a Faculty Development Expert will provide faculty with the "right" knowledge in teaching, usually in the form of content/curriculum suggestions and teaching methods. However, if one believes that knowledge is socially constructed, then faculty development activities become the facilitation of this process of knowledge-building among faculty. Through these means, this project will result in the establishment of a distinctive paradigm of an organic learning community which includes a faculty development model based on a socially constructed, interdisciplinary understanding of knowledge. And it is this distinctive characteristic that faculty involved with (or even having contact with) this project find either exciting and promising or threatening.

Program Evaluation

The purpose of the evaluation is twofold: 1) to assess whether the program has met its original goals, 2) to determine what methods have been successful in implementing it and, relatedly, how in the course of the project the design of the project should be altered. Since the program should serve as a national model, the evaluation is formative, providing insights and information for other institutions that might replicate some or parts of it.

Two evaluators were contacted, Judith Levy, head of the Department of Chemistry at Eastern Michigan University, and Gloria Rogers, Dean for Academic Advising at Rose-Hulman Institute of Technology. The plan for evaluation includes the following:

- Extensive quantitative and qualitative data collection, which will offer accountability and facilitate the possibility that the program will serve as a national model.

♦ Multi-group evaluation of students, Distinguished Visiting Professors, Faculty Fellows, and campus administrators in order to completely measure and analyze the outcomes of the program.

The evaluators will report on their findings periodically and contribute to the final comprehensive document at the end of the project period.

What We Have Learned Thus Far:

The program has already begun to have what we consider an impressive impact, reaching several hundred faculty and staff as well as students on UW campuses. What we have learned is that what we have set out to do is more complicated and challenging than we had anticipated. As I implied earlier, this project is larger than the sum of its parts. We are trying to do more than develop new courses around the state. Rather we are trying to build interdisciplinary science communities within and throughout the state where the ways in which knowledge is transmitted and where the learning climate is significantly different from now. In effect, we are trying to transform the culture from, as one or our Advisory Board members put it, a caste system to one where education is conducted through collaborative, creative approaches.

In the process, we have learned a great deal. For one thing, each department and each institution has its own culture which must be taken into consideration in the planning of each host community -- especially complicated in the CC. It is important to be flexible and to involve faculty and administrators (support from both top and bottom are essential) at every step of the way in order to build a sense of ownership. It has also become clear to me, at least, that faculty development is the most important component of this project -- someone in a meeting a few days ago asked how we could encourage students to collaborate and participate in these new strategies -- but students aren't the challenge here; I'm convinced that they will be excited by challenging teachers; it's the faculty we need to hook).

As a result of what we've been learning, we're making adjustments both in the theoretical base and the nuts and bolts of the program as we've gone along. For example each of the campuses in the CC has a Coordinator whose work has turned out to be more time-consuming than we had anticipated; as a result, we've squeezed out some additional funds to provide them with release time. While it seemed as if we had a great deal of

money, we have been aware of additional needs that we didn't anticipate -- some of which require funding (although not all). On a larger issue, we also have come to realize, as a result of the observations of our DVP's, evaluators, and others, that the project must add to its goals the increase in recruitment and retention of women and minority faculty members.

On a more positive note, our creative DVP's, Faculty Fellows, and Coordinators have taken the program in new directions, providing unanticipated insights as to the greater possibilities of this project -- how to make it work and institutionalize it. For example, at our most recent meeting in the Collaborative Community, I was delighted to find that the Fellows have become a community within the community -- this will surely contribute to long term project goals. It was gratifying to hear very positive comments from faculty and administrators alike, some of whom had previously seemed somewhat skeptical about the project. These words are being translated into deeds as they have initiated discussions of ideas and plans for continuing and even expanding the project to other collaborative communities.

Future Plans: As indicated above, the project will continue to evolve through the 1995-96 academic year, becoming gradually institutionalized and eventually affecting many more hundreds of faculty and thousands of students statewide.

Because of the structure of the UW System, we have the unique opportunity to experiment with faculty and curriculum development in a wide variety of settings. Moreover, the Consortium's experience with collaborative initiatives and our resources, such as the Women's Studies Librarian's office, has been very helpful in implementing this project.

We anticipate that the project will serve as a model for other academic programs facing similar challenges regarding science education in the midst of problems in staffing and resource development in financially difficult times -- both within our system and across the nation. We hope that the outcome of the project evaluation and our products will help to shape other faculty development and pedagogical and curriculum reform initiatives for years to come.